Programme	B.Sc. (Engg.) Energy Engineering	Course Code	EE 122	Credit Hours	3 + 1 = 4
Course Title	**Engineering Thermodynamics**				

Course Introduction

This course starts with the foundational concepts of thermodynamics which includes properties of systems and their mutual relationships. It also links the principles of thermodynamics with daily life applications including thermodynamics of energy systems like heat pumps, heat engines, air conditioners, refrigerators etc.

Mapped SDGs	SDG-9: Industry, Innovation and Infrastructure

Learning Outcomes

1. **Define** the fundamentals of thermodynamics. (C1)
2. **Describe** the laws and concepts used in thermodynamics. (C2)
3. **Solve** thermodynamics engineering problems. (C3)

Course Content		Assignments/Readings
Week 1	**Unit-I Fundamentals of thermodynamics** 1.1 Thermodynamics and energy	The teacher may assign home assignments/problem-based learning/reading materials/learning activity etc.
Week 2	1.2 Systems and its properties 1.3 State and equilibrium 1.4 Zeroth law of thermodynamics	
Week 3	1.5 Forms of energy 1.6 Energy transfer by heat and wor	
Week 4	1.7 First law of thermodynamics 1.8 Energy balances 1.9 Energy conversion efficiencies	
Week 5	**Unit-II Pure substances** 2.1 Phases of a pure substance 2.2 Phase-change processes 2.3 T-v diagram 2.4 P-v diagram	
Week 6	2.5 P-T diagram 2.6 P-v-T surfaces	
Week 7	2.7 Property tables 2.8 Enthalpy, saturated liquid and vapor, saturated and superheated steam	
Week 8	2.9 Ideal gas equation and compressibility factor	
Week 9	**Unit-III Second law of thermodynamics** 3.1 Thermal efficiency 3.2 Heat Engines 3.3 Refrigeration cycle and heat pumps 3.4 The Carnot cycle	

Week 10	3.5 Calculations for coefficients of performance 3.6 Reversible and irreversible processes	
Week 11	3.7 Entropy 3.8 Heating, Ventilation and Air Conditioning (HVAC)	
Week 12	**Unit-IV Gas power cycles** 4.1 Otto cycle	
Week 13	4.2 Diesel cycle	
Week 14	4.3 Brayton cycle	
Week 15	4.4 Development of gas turbine	
Week 16	4.5 Analysis of gas power cycles as per second law	

Textbooks and Reading Material

1. Cengel, Yunus A., and Boles, Michael A. (2019), "Thermodynamics: An Engineering Approach 9th Edition McGraw-Hill
2. Reisel, J. R. (2021). Principles of Engineering Thermodynamics, SI Edition. United States: Cengage Learning Journal Articles/ Reports
3. Moran, Shapiro (2014). Fundamentals of Engineering Thermodynamics, 8th Edition.
4. Eastop T. D., McConkey A. (1993), "Applied Thermodynamics for Engineering Technologists" 5th Edition John Wiley & Sons
5. Sonntag, R. E., Borgnakke, C., & Van Wylen, G. J., (2001) Fundamentals of Thermodynamics, 6th Edition, John Wiley & Sons.

Teaching Learning Strategies

The learning and teaching strategies for the Material Balance course will incorporate a variety of approaches to enhance understanding and engagement. Lectures will utilize multimedia and whiteboards, to present core concepts effectively. Group discussions will foster critical thinking. Home tasks will provide hands-on experience in applying material balance techniques, complemented by reading and writing assignments to deepen the concepts.

Assignments: Types and Number with Calendar

Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Activity	-		-	Assignment 1		-	Quiz 1	

Week	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Activity	-	-		Assignment 2		Quiz 2	-	

The abovementioned schedule of assignments/quizzes/presentations is tentative. The schedule will be provided to the students at the start of semester.

Assessment			
Sr. No.	**Elements**	**Weightage**	**Details**
1.	Midterm Assessment	35%	Written assessment at the mid-point of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work, report writing, and viva-voce examination, etc.
2.	Sessional Assessment	25%	This assessment may include classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written assessment at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work, report writing, and viva-voce examination, etc.